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(54) **A device for automatically milking an animal**

Vorrichtung zum automatischen Melken eines Tieres

Dispositif pour traire automatiquement un animal

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Description

[0001] The invention relates to a device for automatically milking an animal, according to the preamble of claim 1.

[0002] Such a device is known from the patent specification US 6371046-B1. Herein is disclosed an automatically milking system, with a milking robot for attaching teat cups and a computer for controlling the milking robot. A central analysing station is provided with a common sensor for sensing milk quality. Between each teat cup and the analysing station a testing line with a clamping device is provided for delivering milk to the analysing station.

[0003] WO97/01953 describes a milk claw with a measuring chamber. In this measuring chamber a level sensor and a measuring cell are provided. Four teat cup lines connect this measuring chamber with a corresponding teat cup. For performing an analysing measurement on milk from a specific teat, only one teat cup performs a milking movement while the other teat cups are in rest.

[0004] It is an object of the invention to provide a device for automatically milking an animal, by means of which measurements on milk can accurately be performed in a relatively cheap manner.

[0005] For this purpose, according to the invention, a device for automatically milking an animal of the above-mentioned type comprises the features of the characterizing part of claim 1. With the aid of the milk-determining element, which may be a relatively cheap element, the computer is capable of determining from which teat cup comes the milk that is measured by the sensor. Thus the measured values from the sensor can be stored and processed per teat cup, if desired. Preferred embodiments of the invention are set out in the dependent claims.

[0006] In an embodiment of the device according to the invention, a valve that is controlled by the milk-determining element is disposed in each teat cup line between the milk-determining element and the common milk line, and it is possible to open the valve when a particular buffer quantity of milk required for performing the measurement is present, so that the buffer quantity can be measured by the sensor.

[0007] For the purpose of guiding air to beyond said one sensor, in an embodiment of a device according to the invention each teat cup line is provided with a bypass line, the bypass line having a first end that is connected to the teat cup line in a position between the teat cup and the milk-determining element and a second end that is connected to the common milk line in a position downstream relative to said one sensor.

[0008] In an advantageous embodiment of a device according to the invention, said one sensor is a spectrum analyser, an infrared meter, a proximity infrared meter or a conductivity meter.

[0009] The invention will now be explained in further

detail with reference to the accompanying figures, in which:

Figure 1 shows diagrammatically a first embodiment of a device according to the invention;

Figure 2 shows diagrammatically a second embodiment of a device according to the invention, and

Figure 3 shows diagrammatically a third embodiment of a device according to the invention.

[0010] Figure 1 shows diagrammatically a first embodiment of a device for automatically milking an animal. The device is provided with a (non-shown) milking robot that is known per se for connecting at least two teat cups, in the embodiment shown four teat cups 1, 2, 3, 4, to respective teats of the animal. Such a milking robot comprises customarily a (non-shown) computer for controlling the operation of the milking robot and the relevant peripheral equipment, and for receiving measurement data obtained by measurements performed on milk obtained from an animal.

[0011] The device is provided with a common sensor 5, in particular a spectrum analyser, by means of which, on the basis of the spectrum obtained, inter alia measurements on the components of the milk obtained can accurately be performed. Said common sensor 5 performs measurements on the milk obtained from all the teat cups 1, 2, 3, 4 and is connected to the computer via a non-shown line for emitting a measurement signal to the computer. However, the invention is not limited to one sole common sensor that performs measurements on milk obtained from all the teat cups, but may be applied to a common sensor that performs measurements on milk obtained from at least two different teat cups. The common sensor 5 is disposed in a common milk line 6, and each teat cup 1, 2, 3, 4 is connected to the common milk line 6 via a respective teat cup line 7, 8, 9, 10. In each teat cup line 7, 8, 9, 10 there is provided a milk-determining element 11, 12, 13, 14 for determining the teat cup from which comes the milk that is present in the common milk line and for emitting a determination signal to the computer. The computer combines the data from the milk-determining means and the measurement signals from the common sensor 5, so that measured values for the milk obtained from the respective teat cups, or the respective quarter of the animal, can be obtained. The milk-determining means are thus used for determining the teat cup from which comes the milk that is measured by the common sensor. By 'a sensor or a milk-determining element disposed in a line' is meant that the sensor or the milk-determining element is positioned relative to the line in such a way that a measurement on the milk in the line can be performed. Accordingly, only one sensor 5 is required for measuring the milk obtained from all the teat cups.

[0012] Figure 2 shows diagrammatically a second embodiment of a device for performing measurements on milk obtained from an animal. In this embodiment a

controlled valve 19, 20, 21, 22 is disposed in each teat cup line 7, 8, 9, 10 between the milk-determining element 11, 12, 13, 14 and the common milk line 6. In this manner, when a controlled valve is in its closed position, a buffer quantity of milk can be collected. When the relevant milk-determining element detects a particular, for example a predetermined buffer quantity, it is possible for said milk-determining element to control the relevant valve in such a way that it is opened (and to control the valves in the other teat cup lines in such a way that they remain closed) thus enabling the sensor 5 to perform measurements on the relevant milk.

[0013] In order to prevent air present in the milk from disturbing the measurements, each teat cup line 7, 8, 9, 10 is provided with a bypass line 23, 24, 25, 26. Each bypass line has a first end that is connected to the respective teat cup line in a position between the teat cup and the milk-determining element and a second end that is connected to the common milk line in a position downstream relative to the common sensor.

[0014] Figure 3 shows diagrammatically a third embodiment of a device for performing measurements on milk obtained from an animal. In this embodiment the device is provided with a common milk line 6, each teat cup 1, 2, 3, 4 being connected, via a teat cup line 7, 8, 9, 10, to the common milk line 6 in which the common sensor 5 is disposed. In each teat cup line 7, 8, 9, 10 there is further disposed a controlled valve 19, 20, 21, 22, as well as a milk-determining element 11, 12, 13, 14 for detecting milk upstream relative to the controlled valve 19, 20, 21, 22. In this embodiment the portion of each teat cup line that is located upstream relative to the valve extends substantially vertically, so that there is created above a closed valve a milk column as buffer quantity. In order to prevent air present in the milk from disturbing the measurements, each teat cup line 7, 8, 9, 10 is provided with a bypass line 23, 24, 25, 26. Each bypass line has a first end that is connected to the respective teat cup line in a position between the teat cup and the milk-determining element and a second end that is connected to the common milk line in a position downstream relative to the common sensor.

[0015] It will be obvious that also other embodiments for obtaining a buffer may be applied within the scope of the invention. It is possible for example to use a buffer reservoir 28, 29, 30, 31 as connection between teat cup line and bypass line. It is then also possible to integrate the controlled valve and the milk-determining element into the buffer reservoir. It will further be obvious that, although the invention has been described with reference to a spectrum analyser as only sensor, the invention may also be applied if said one sensor is an infrared meter, a proximity infrared meter, a conductivity meter or the like.

Claims

1. A device for automatically milking an animal, which device is provided with:

a milking robot,
a computer for controlling the operation of the device,
a measuring device for performing measurements on milk obtained from an animal,
at least two teat cups (1, 2, 3, 4),
a common milk line (6) for discharging milk coming from the at least two teat cups (1, 2, 3, 4), each teat cup (1, 2, 3, 4) being connected via a teat cup line (7, 8, 9, 10) to the common milk line (6), and said measuring device comprises a common sensor (5) for performing measurements on milk obtained from an animal and for emitting a measurement signal, the common sensor (5) being disposed in the common milk line 6,

characterized in that in each teat cup line (7, 8, 9, 10) a milk-determining element (11, 12, 13, 14) for determining the teat cup (1, 2, 3, 4) from which comes the milk present in the common milk line (6) and for emitting a determination signal is provided, and in that the computer is suitable for combining the measurement signal and the determination signal.

2. A device as claimed in claim 1, characterized in that a valve (19, 20, 21, 22) that is controlled by the milk-determining element (11, 12, 13, 14) is disposed in each teat cup line (7, 8, 9, 10) between the milk-determining element (11, 12, 13, 14) and the common milk line (6).
3. A device as claimed in claim 2, characterized in that each teat cup line (7, 8, 9, 10) is provided with a bypass line (23, 24, 25, 26), the bypass line (23, 24, 25, 26) having a first end that is connected to the teat cup line (7, 8, 9, 10) in a position between the teat cup (1, 2, 3, 4) and the milk-determining element (11, 12, 13, 14) and a second end that is connected to the common milk line (6) in a position downstream relative to the common sensor (5).
4. A device as claimed in any one of the preceding claims, characterized in that the common sensor (5) is a spectrum analyser, an infrared meter, a proximity infrared meter or a conductivity meter.

Patentansprüche

1. Vorrichtung zum automatischen Melken eines Tie-

res, wobei die Vorrichtung versehen ist mit:

- einem Melkroboter,
- einem Computer zum Steuern des Betriebs der Vorrichtung,
- einer Meßvorrichtung zum Durchführen von Messungen an der von einem Tier gewonnenen Milch,
- mindestens zwei Zitzenbechern (1, 2, 3, 4),
- einer gemeinsamen Milchleitung (6) zum Ableiten von Milch aus den mindestens zwei Zitzenbechern (1, 2, 3, 4), wobei jeder Zitzenbecher (1, 2, 3, 4) über eine Zitzenbecherleitung (7, 8, 9, 10) mit der gemeinsamen Milchleitung (6) verbunden ist und die Meßvorrichtung einen gemeinsamen Sensor (5) umfaßt, um Messungen an von einem Tier gewonnener Milch durchzuführen und ein Meßsignal auszugeben, wobei der gemeinsame Sensor (5) in der gemeinsamen Milchleitung (6) angeordnet ist,

dadurch gekennzeichnet, daß in jeder Zitzenbecherleitung (7, 8, 9, 10) ein Milchbestimmungselement (11, 12, 13, 14) angeordnet ist, um den Zitzenbecher (1, 2, 3, 4) zu bestimmen, von dem die in der gemeinsamen Milchleitung (6) befindliche Milch kommt, und ein Bestimmungssignal auszugeben, und daß der Computer geeignet ist, das Meßsignal und das Bestimmungssignal zu kombinieren.

2. Vorrichtung nach Anspruch 1, **dadurch gekennzeichnet, daß** ein Ventil (19, 20, 21, 22), das von dem Milchbestimmungselement (11, 12, 13, 14) gesteuert wird, in jeder Zitzenbecherleitung (7, 8, 9, 10) zwischen dem Milchbestimmungselement (11, 12, 13, 14) und der gemeinsamen Milchleitung (6) angeordnet ist.
3. Vorrichtung nach Anspruch 2, **dadurch gekennzeichnet, daß** jede Zitzenbecherleitung (7, 8, 9, 10) mit einer Bypassleitung (23, 24, 25, 26) versehen ist, wobei die Bypassleitung (23, 24, 25, 26) ein erstes Ende aufweist, das an einer Stelle zwischen dem Zitzenbecher (1, 2, 3, 4) und dem Milchbestimmungselement (11, 12, 13, 14) mit der Zitzenbecherleitung (7, 8, 9, 10) verbunden ist, sowie ein zweites Ende, das an einer Stelle stromabwärts von dem gemeinsamen Sensor (5) mit der gemeinsamen Milchleitung (6) verbunden ist.
4. Vorrichtung nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, daß** der gemeinsame Sensor (5) ein Spektrum-Analysator, ein Infrarotmeßgerät, ein Näherungs-Infrarotmeßgerät oder ein Leitfähigkeitsmeßgerät ist.

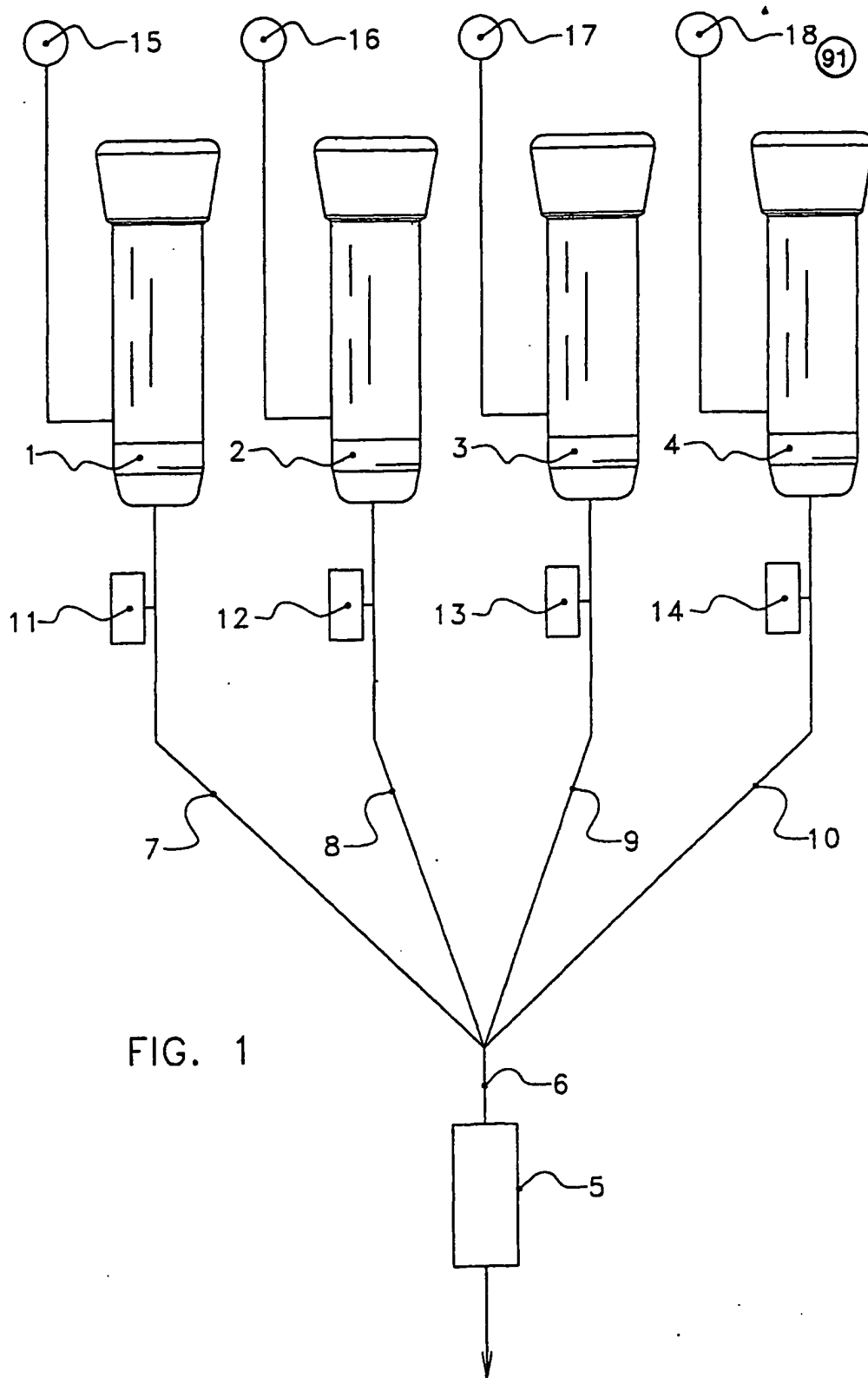
Revendications

1. Dispositif pour traire automatiquement un animal, lequel dispositif est pourvu :

d'un robot de traite,
d'un ordinateur pour contrôler le fonctionnement du dispositif,
d'un dispositif de mesure pour effectuer des mesures sur le lait obtenu d'un animal,
d'au moins deux gobelets trayeurs (1, 2, 3, 4),
d'une conduite de lait commune (6) pour évacuer le lait provenant d'au moins deux gobelets trayeurs (1, 2, 3, 4), chaque gobelet trayeur (1, 2, 3, 4) étant relié via une conduite de gobelet trayeur (7, 8, 9, 10) à la conduite de lait commune (6), et ledit dispositif de mesure comprend un capteur commun (5) pour effectuer des mesures sur le lait obtenu d'un animal et pour émettre un signal de mesure, le capteur commun (5) étant disposé dans la conduite de lait commune (6),

caractérisé en ce que dans chaque conduite de gobelet trayeur (7, 8, 9, 10) un élément de détermination du lait (11, 12, 13, 14) destiné à déterminer de quel gobelet trayeur (1, 2, 3, 4) provient le lait présent dans la conduite de lait commune (6) et à émettre un signal de détermination est prévu, et **en ce que** l'ordinateur est approprié pour combiner le signal de mesure et le signal de détermination.

2. Dispositif selon la revendication 1, **caractérisé en ce qu'une** valve (19, 20, 21, 22) qui est contrôlée par l'élément de détermination du lait (11, 12, 13, 14) est disposée dans chaque conduite de gobelet trayeur (7, 8, 9, 10) entre l'élément de détermination du lait (11, 12, 13, 14) et la conduite de lait commune (6).
3. Dispositif selon la revendication 2, **caractérisé en ce que** chaque conduite de gobelet trayeur (7, 8, 9, 10) est pourvue d'une conduite de dérivation (23, 24, 25, 26), la conduite de dérivation (23, 24, 25, 26) ayant une première extrémité qui est reliée à la conduite de gobelet trayeur (7, 8, 9, 10) dans une position entre le gobelet trayeur (1, 2, 3, 4) et l'élément de détermination du lait (11, 12, 13, 14) et une seconde extrémité qui est reliée à la conduite de lait commune (6) dans une position en aval par rapport au capteur commun (5).
4. Dispositif selon l'une quelconque des revendications précédentes, **caractérisé en ce que** le capteur commun (5) est un analyseur de spectre, un appareil de mesure à infrarouge, un appareil de mesure à infrarouge de proximité ou un conductimètre.



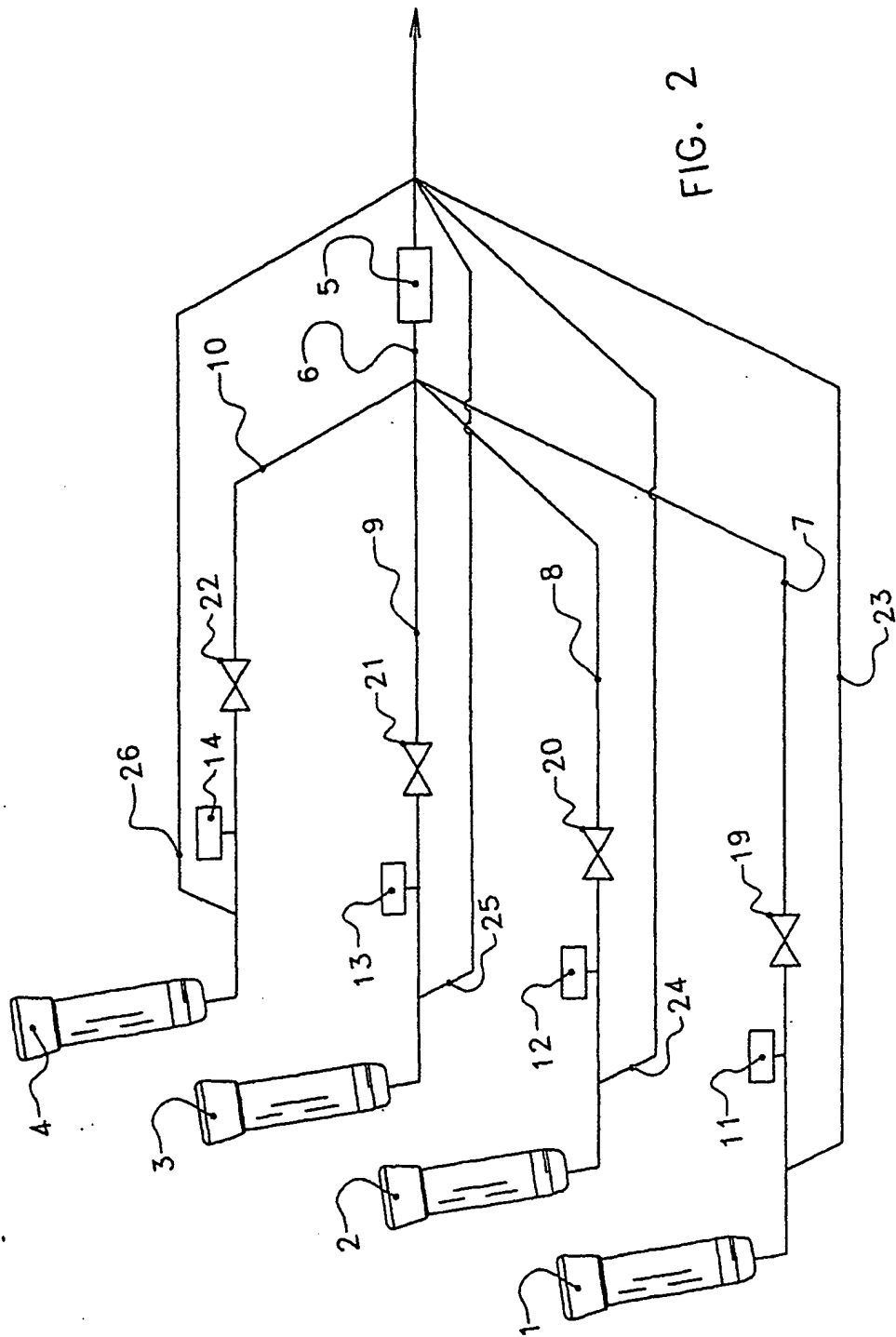


FIG. 2

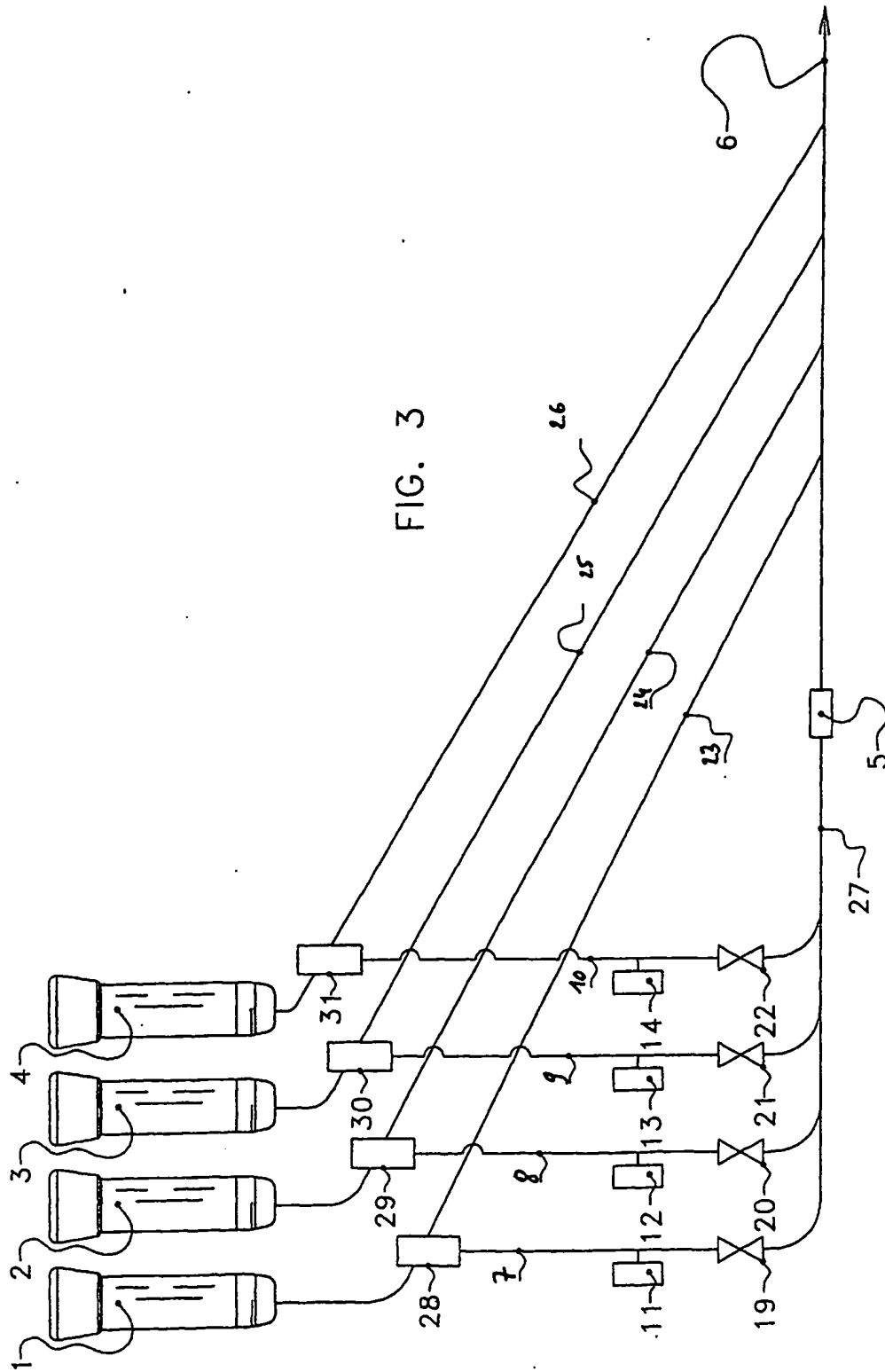


FIG. 3